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## *Diversity of Mushrooms in Kashmir Himalayas*

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**The UT of Jammu and Kashmir has distinct agro climatic zones comprising subtropical, intermediate, temperate and cold arid zones. The Kashmir Valley falls under temperate zone and the forests consists of both conifers as well as broad leaved tree species. Besides tree species, several types of mushrooms are found in Kashmir Valley. Kashmir possesses a prime place in the variety and galaxy of macro fungi due to wide agro-climatic variations, diverse physiographic and undulating topography. However, the documentation of mushroom flora is still in pioneer stage and a large number of fungi are yet to be un-recorded from the area. Mushroom season in Kashmir can be witnessed best from the spring up to the early snowfall. Kashmir is the best place for mushroom cultivation and processing. Most of the people in Kashmir belong to rural background and have little resources to meet their essential needs. Mushroom cultivation on commercial scale can help the landless, small and marginal farmers of these hilly areas to increase their income, which can help them to diversify their economic activity. It can provide and raise sufficient employment opportunities for the unemployed youth, and weaker sections of the society.**

### **INTRODUCTION**

Kashmir Himalayas is known for its rich diversity of mushrooms. Mushrooms are the reproductive structures produced by some fungi. They are cosmopolitan heterotrophic organisms that are quite specific in their nutritional and ecological requirements. Generally, mushrooms are divided into humicolous, lignicolous, coprophilous, fungicolous, parasitic or saprophytic or may show some mycorrhizal associations with both broad-leaved forest trees and gymnospermous taxa. Because of their unique flavor and texture, mushrooms are the preferred food commodities among the number of nonconventional

foodstuffs primarily because of their unique flavor and texture. The UT of Jammu and Kashmir, is a rich repository of the unexplored macrofungal wealth due to its varied climatic and topographic conditions, thus providing congenial environment for the lavish growth of this heterogenous group of fungi.

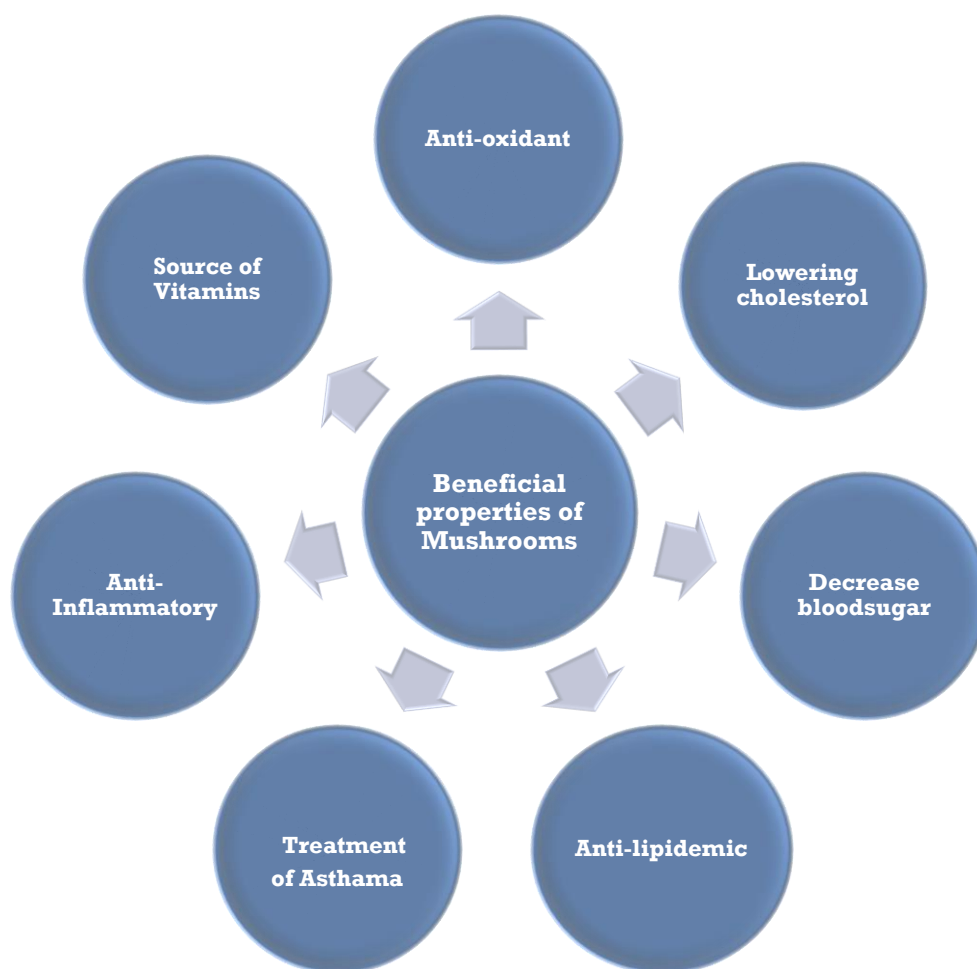
Edible mushrooms have been collected and consumed by people since thousands of years. Mushrooms have been exploited commercially world over and may be cultivated or gathered from the wild. Research conducted by several researchers across the World show that the consumption rate of mushrooms across the World has increased. Inadequate exploration and lack of proper identification is a major bottleneck in the way of fair assessment of their extent of diversity calling for an urgent exploration for documentation and characterization. Thus there is an urgent to explore the treasure of edible mushrooms. Several

mycologists have reported ethnomycological usage of this natural resource wealth from some regions of India. However, indigenous knowledge about edible and medicinal mushrooms has not been given significant attention.

#### **MEDICINAL BENEFITS OF MUSHROOMS**

Mushrooms have numerous medicinal benefits. They are a great source of fibre, protein, and have antioxidant properties. Mushrooms are becoming more important in diet due to their nutritional value particularly high protein and low fat. Due to the presence of various bioactive compounds, mushrooms act as antibacterial, lowering cholesterol agents, antitumor, and antimicrobial properties and immune system enhancer.

They are also used for the treatment of heart ailments, skin diseases, asthma, insomnia, allergies, diabetes, arthritis, rheumatoid, cholera, fevers, diaphoretic,



**Figure 1. Beneficial properties of Mushrooms**

diarrhea, dysentery, cold anesthesia, liver disease, gall bladder disease, etc. Scientific studies have confirmed that substances extracted from mushrooms can reduce blood pressure, blood cholesterol and blood sugar level as well as inhibit platelet aggregation. It is well known that mushrooms are rich in proteins, vitamins, minerals, fiber, antioxidants and cholesterol lowering properties and are known as "host defense potentiators."

## IMPORTANT MUSHROOMS OF KASHMIR

### 1 *Agaricus campestris*

**Common name:** Field Mushroom/ Meadow mushroom

**Pileus:** The pileus is white in colour, 5-10cm in diameter, hemispherical in shape but flattens with maturity.

**Gills:** Gills are initially pinkish in color and later becomes dark brown.

**Stipe:** The stipe is 3-10 cm tall, bears a single ring and is whitish in color.

**Spore:** The spore print is dark brown in color. The spores are elliptical in shape and thick walled.

**Season:** Summer

**Habit and habitat:** Growing on dead logs and living trees primarily hard woods.

**Spore print:** Black, Brownish.

**Edibility:** Edible



Figure 2. *Agaricus campestris*

### 2. *Boletus edulis*

**Common name:** King bolete.

**Pileus:** The pileus is 4-14 cm in diameter, convex in shape when young and flat at maturity. The color of pileus is reddish brown fading to white at margins.

**Stipe:** The stipe is 5-8cm long and 1- 2.5 cm thick solid and club shaped. The lower surface of the cap

possesses pores which are white at younger stages but turn yellowish at maturity.

**Odour and taste:** Not distinctive. Spore print: The spore print is olive brown in color. Spores: The spores are elliptical to spindle shaped.

**Habit and habitat:** Saprobic, growing on dead logs and leaving trees primarily hard woods, but sometimes on conifers.

**Season:** Spring

**Edibility:** Edibles.



Figure 3. *Boletus edulis*

### 3. *Bovista plumbea*

**Common name:** Puff ball

**Fruiting body:** The fruiting body is 3- 8cm in diameter. Its oval, spherical, pear shaped. The interior of the fruiting body is white and hard initially but changes into spore mass at maturity.

**Spores:** Brown in color, roughly spherical 1, 3.5-? micron in diameter.

**Habit and Habitat:** Mycorrhizal, growing singly, in broad leaved forests.

**Season:** Spring.

**Edibility:** Edible.



Figure 4. *Bovista plumbea*

#### 4. *Coprinus micaccous*

**Common name:** Mica cap, shiny cap, and glistening inky cap.

**Pileus:** The pileus is 2-15cm, oval when young, expanding to broadly convex or bell shaped, honey brown, or sometimes paler, buttons covered with mica like granules with frequently wash off with rain or dew.

**Gills:** Adnexed or free from it, pale becoming brown, then black, close or crowded. **Stipe:** The stipe is 2-8cm long, white, hollow.

**Flesh:** White to pale throughout, thin, soft.

**Odor and taste:** Not distinctive.

**Spore print:** Black.

**Spores:** sub-elliptical to mitriform, smooth.

**Habit and habitat:** Saprobic, growing in clusters on decaying wood.

**Season:** Spring and summer.

**Edibility:** Edible at young stage.



Figure 5. *Coprinus micaccous*

#### 5. *Coprinus atramentaria*

**Common name:** Common ink cap or inky cap.

**Pileus:** The pileus is 3-6 cm high and oval when young expanding to convex, up to 10cm across, grayish or gray brown, fairly smooth, but usually finely scaly over the center.

**Gills:** Free from stipe, whitish, becoming black, deliquescent (turning to black "ink"), close or crowded.

**Stipe:** The stipe is 8-15 cm long, white, hollow. **Flesh:** White or pale grey throughout, thin, soft.

**Odour and taste:** Not Distinctive. **Spore print:** Black.

**Spores:** Elliptical, smooth.

**Habit and Habitat:** Saprobic, growing in clusters on decaying wood and also in grassland meadow.

**Season:** Spring, summer.

**Edibility:** Edible (but sometimes poisonous), when combined with alcohol.



Figure 6. *Coprinus atramentaria*

#### 6. *Ganoderma lucidum*

**Common name:** Reishi mushroom/ Lingzhi mushroom.

**Pileus:** The pileus is 10 cm in diameter, Fan shaped, with white colored zones towards the margin.

**Stipe:** The stipes 3-14 cm long and 3cm thick, twisted varnished and colored like the cap, often distinctly angled away from one side of the cap.

**Odour and taste:** Not distinctive

**Gills:** Absent.

**Spore:** The spores are more or less elliptical, double walled and smooth.

**Habit and Habitat:** Saprobic, growing on logs.

**Season:** Spring.

**Edibility:** Choice



Figure 7. *Ganoderma lucidum*

#### 7. *Lentinus tigrinus*

**Common name:** Tiger saw gill.

**Pileus:** The pileus is 1-3 cm wide, board convex with a central depression, fibrillose scaly with small dark brown scales over a tan to brown ground, the margin incurved.

**Gills:** Decurrent, crowded, edges, becoming slightly serrated, white to creamy.

**Stipe:** The stipe is 2-4 cm long, slightly tapered towards the base, scaly with fine brown scales.

**Flesh:** Whitish, unchanging when sliced.

**Odour and taste:** Not distinctive.

**Spore print:** White in color. Spores : Ellipsoid and smooth

**Habit and Habitat:** Saprobic, growing alone scattered or more frequently, gregariously to loosely clustered on the wood of hard woods.

**Season:** Spring

**Edibility:** Edible



Figure 8. *Lentinus tigrinus*

### 8. *Morchella esculenta*

**Common name:** Common morel or Yellow moel.

**Pileus:** The pileus is pale brown in color. The edges of the ridges are usually not darker than the pits and somewhat oval in outline, sometimes bluntly cone shaped with a rounded top or more elongate. Pileus is hollow and attached to the stipe at the lower edge, and typically about 3-7cm broad by 2-10 cm tall.

**Stipe:** The stipe is white to pale yellow, hollow and straight with bulbous base, generally about 2-9 cm long.

**Flesh:** The flesh is brittle.

**Spores:** Ellipsoidal, smooth, in ascus, each ascus contains 8 ascospores.



Figure 9. *Morchella esculenta*

**Habit and Habitat:** Saprotrophic or mycorrhizal found in forests, orchards, woods, disturbed grounds and burnt areas.

**Season:** Early spring.

**Edibility:** Edible

### 9. *Pleurotus ostreatus*

**Common name:** Oyster mushroom

**Pileus:** The pileus is 3-15cm across, broadly convex, becoming flat to shallowly depressed, kidney shaped to fan shaped in outline, pale to dark brown.

**Gills:** Decurrent, close, whitish, becoming yellowish in age.

**Stipe:** Usually rudimentary, whitish, hairy to velvety, tough.

**Flesh:** Thick, white, unchanging when sliced.

**Odour and taste:** Odour distinctive, taste mild.

**Spore print:** White to faintly yellowish.

**Spores:** Cylindrical and ellipsoidal, smooth.

**Habit and Habitat:** Saprobic, growing in shelf like clusters on dead logs and living trees primarily hard woods, but sometimes on conifers.

**Season:** Spring.

**Edibility:** Choice.



Figure 10. *Pleurotus ostreatus*

### 10. *Ramaria botrytis*

**Common name:** Clustered coral or Pink tipped Coral mushroom.

**Fruiting body:** 7-15 cm wide and 6-20 cm tall. They are fleshy cauliflower like masses with a stout central system that splits into a few lower primary branches before branching densely above. The stems are short and thick between 1.5- 6cm in diameter and taper down wards.

**Flesh:** Flesh is thick and white.

**Spores:** The spores are yellowish and deposit, or ellipsoid, feature longitudinal striations and measures about 13.8x 4.7 micron m.

**Season:** Summer

**Edibility:** Edible



**Figure 11.** *Ramaria botrytis*

### 11. *Scleroderma citrinum*

**Common name:** Earth balls.

**Fruiting body:** 2.5- 7cm across, spherical or flattened, often cracked, sessile, potato like in color with brown warty scales. Mycelial strands present on lower side attaches the puffball to the ground or substratum. The interior of the fruiting body is dark gray and hard initially but changes into spore mass at maturity.

**Spores:** Echinulate, oval, 7-12 microns.

**Spore print:** Brownish Black.

**Habit and Habitat:** Mycorrhizal, growing singly scattered, in broad leaved forests.

**Edibility:** Edible when young



**Figure 12.** *Scleroderma citrinum*

### CONCLUSION

There is a huge scope of mushroom cultivation of some economically important mushrooms in the Kashmir valley due to its varied agro climatic conditions and undulated topography. In Kashmir Valley mere than 75% of the population resides in the rural areas that practice farming and have little resources to early and meet their essential needs. Besides being a less labour intensive, indoor mushroom cultivation on commercial scale can help the landless, small and marginal farmers of these hilly

areas to increase their income, which can help them to diversify their economic activity. It can provide and raise sufficient employment opportunities for the unemployed youth, and weaker sections of the society.

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